Cells and Heredity

7-2 The student will demonstrate an understanding of the structure and function of cells, cellular respiration, and heredity. (Life Science)

7.2.1 **Summarize the structures and functions of the major components of plant and animal cells (including the cell wall, the cell membrane, the nucleus, chloroplasts, mitochondria, and vacuoles).**
Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/Future knowledge: In 5th grade (5-2.1), students recalled that the smallest unit of life was the cell and identified its major structures (including cell membrane, cytoplasm, nucleus, and vacuole). In 6th grade (6-2.1), students summarized the characteristics that all organisms share (including the obtainment and use of resources for energy). In high school Biology, students will study the cell theory, other cell structures not listed here, and compare prokaryotic and eukaryotic cells.

It is essential for students to know that a *cell* is the smallest unit of life that conducts all life functions.
- Each cell has major structures (*organelles*) within it that perform these life functions.
- Many organelles are too small to be seen without the aid of a *microscope*.
- Cells in organisms vary in size and shape, but contain most of the same major parts.

Some structures and their functions include:
Cell membrane
- The thin, flexible outer covering of a cell. It controls what enters and leaves a cell.
- *Diffusion* is one way in which materials (for example molecules of sugar or water) move across the cell membrane. It occurs as materials are moved from an area of higher concentration to an area of lower concentration.
- *Osmosis* is the diffusion of water across a membrane.

NOTE TO TEACHER: The term *molecule* is used in biology to represent the smallest particle of a substance that still has the properties of that substance. For example, the smallest particle of a sugar compound is known as a molecule of sugar.

Cytoplasm
- The gel-like fluid inside of a cell made of mostly water.
- The other organelles are embedded in the cytoplasm.

Nucleus
- Contains the genetic material (DNA) and is the control center of the cell.

Vacuole
- Act as temporary storage centers.
- Some store water; others store waste products until they can be eliminated from the cell.

Chloroplasts
- Are the sites where photosynthesis takes place in a plant cell.
- They contain the chlorophyll used to make food.

Mitochondria
- Are the energy producing sites in the cell where respiration takes place.
- It is sometimes called the "powerhouse" of the cell.

Cell wall
- Provides support and shape for plant cells. It is made mostly of cellulose.

It is not essential that students know endoplasmic reticulum, Golgi bodies, lysosomes, or ribosomes; active and passive transport across the cell membrane.

Assessment Guidelines:
The objective of this indicator is to *summarize* the structures and functions of the major components of plant and animal cells; therefore, the primary focus of assessment should be to generalize the main points regarding the major functions of the cell structures (including cell wall, the cell membrane, the nucleus, chloroplasts, mitochondria, and vacuoles). However, appropriate assessments should also require students to *identify* individual parts of the cell or their functions; *illustrate* parts of the cell using words, pictures, or diagrams; *classify* the cell structures as either a structure in an animal cell or a plant cell; or *explain* the processes of diffusion and osmosis.